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(54) **TEMPERATURE SWITCH**

(76) Inventor: **Yu-Kang Yang**, Yung-Kang City (TW)

Correspondence Address:
CHRISTENSEN, O'CONNOR, JOHNSON, KINDNESS, PLLC
1420 FIFTH AVENUE
SUITE 2800
SEATTLE, WA 98101-2347 (US)

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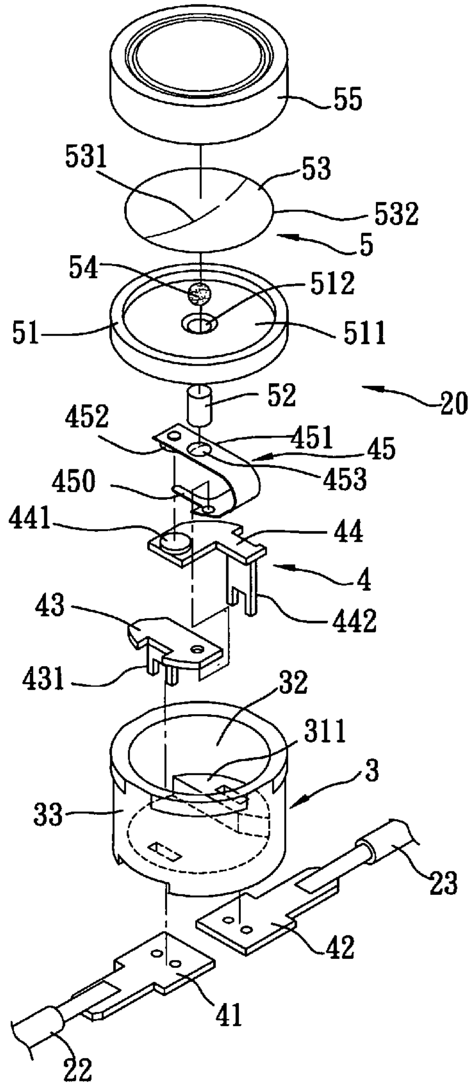
(57) **ABSTRACT**

A temperature switch includes a housing, a switching unit installed in the housing and including a resilient movable conductive plate that is movable between on and off positions, and a temperature control unit mounted on the housing and including a heat-conductive cover that is adapted to conduct heat of a heating element, a temperature-responsive element abutting against the cover, and a control rod and a fuse element disposed between the temperature-responsive element and the movable conductive plate to be moved by the temperature-responsive element so as to contact the movable conductive plate. The control rod has two opposite ends respectively extending towards the temperature-responsive element and the movable conductive plate. The fuse element is disposed at one of the ends. When the fuse element is melted, the control rod is disconnected from the temperature-responsive element either structurally or functionally.



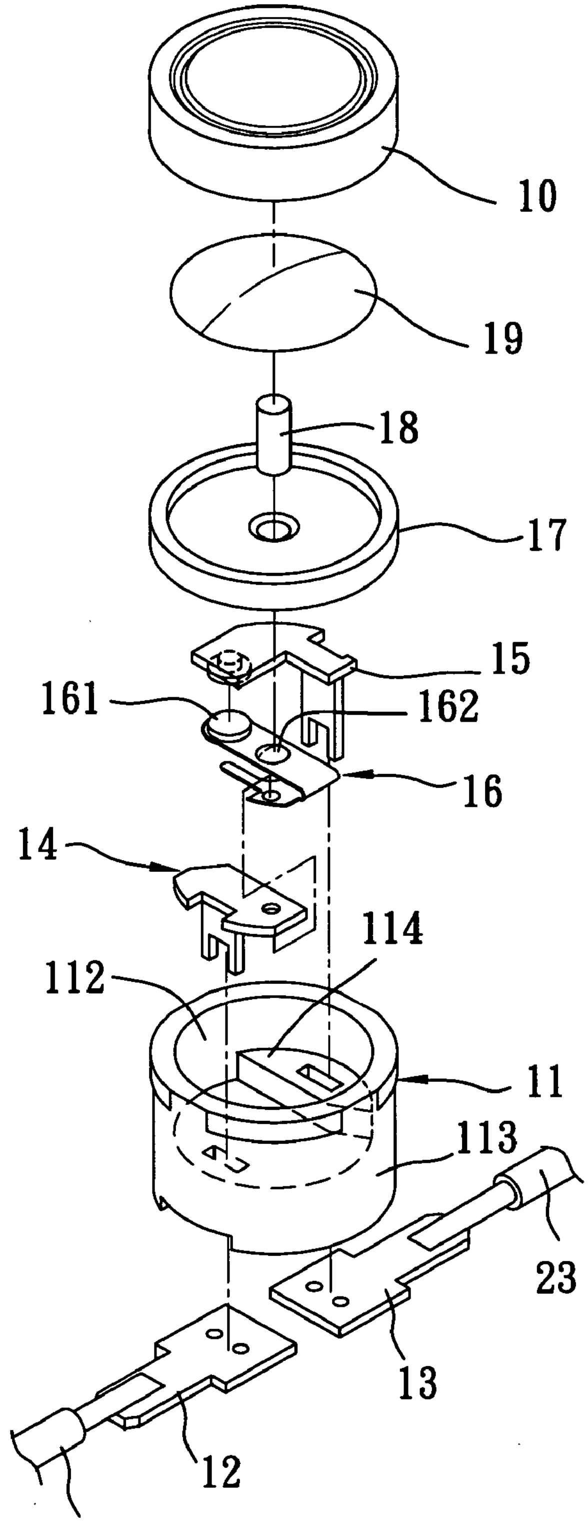


FIG. 1
PRIOR ART

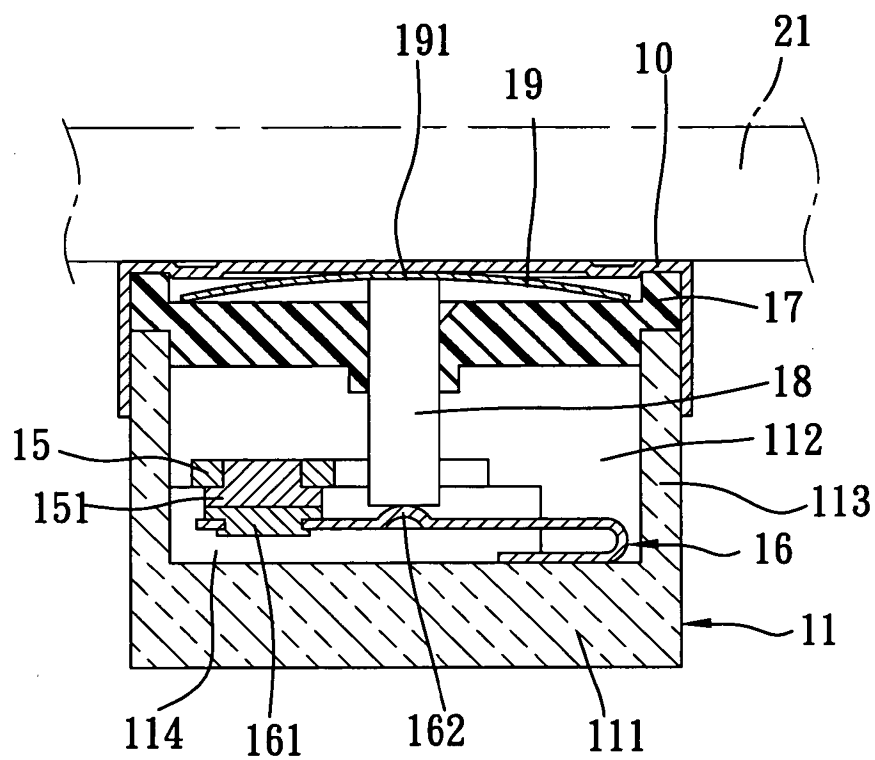


FIG. 2
PRIOR ART

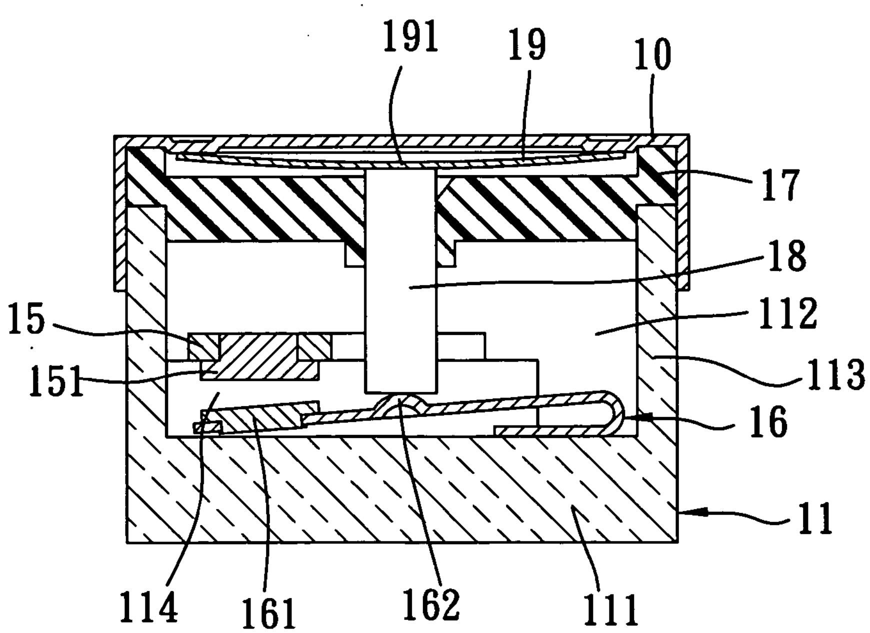


FIG. 3
PRIOR ART

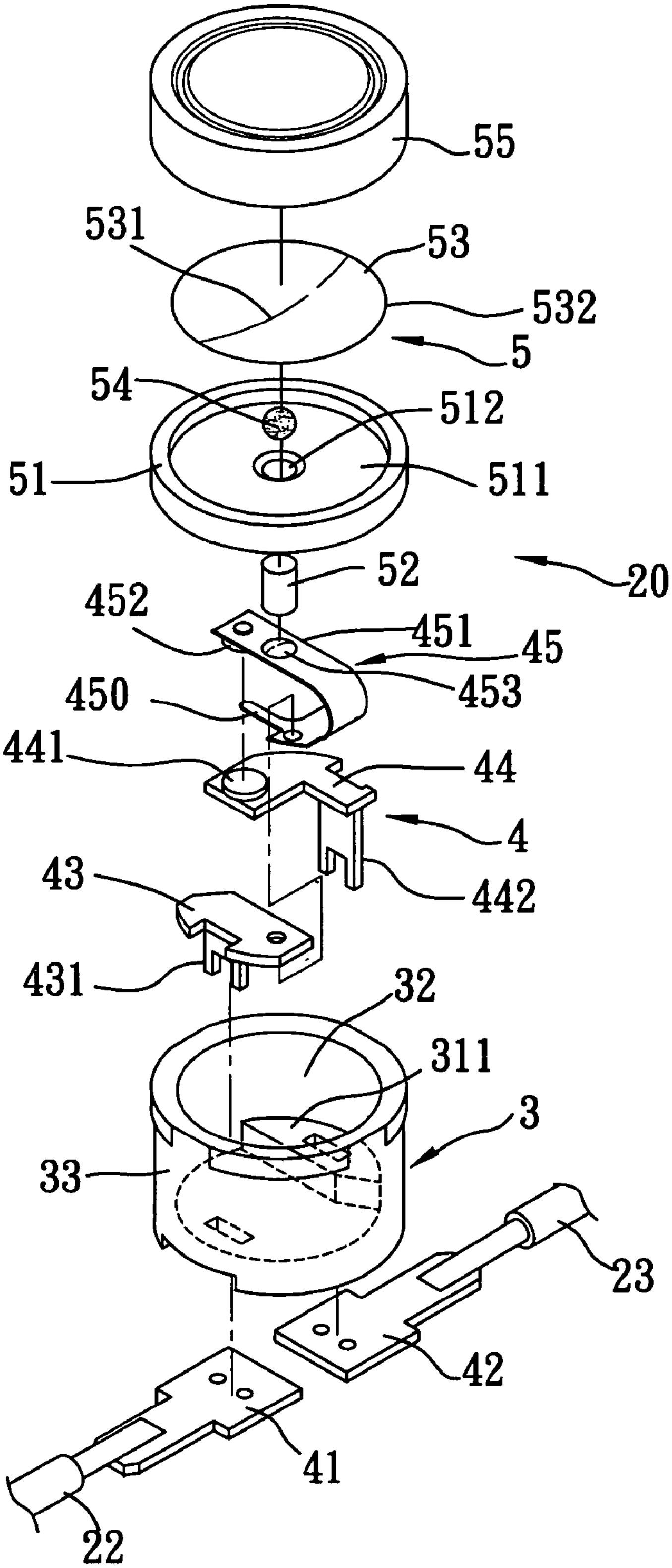

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FIG. 4

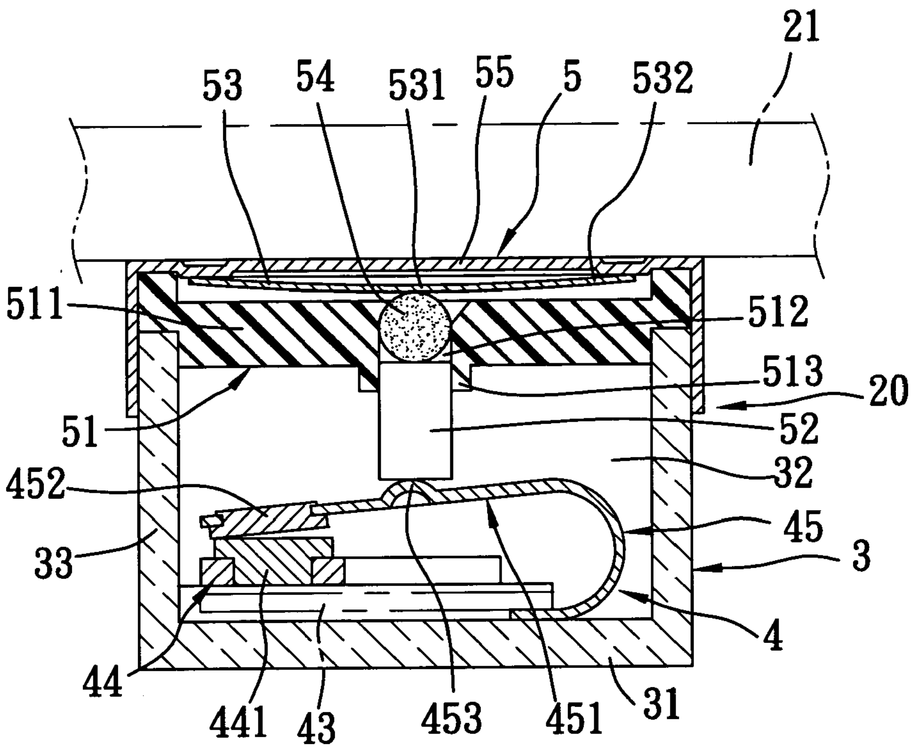
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FIG. 5

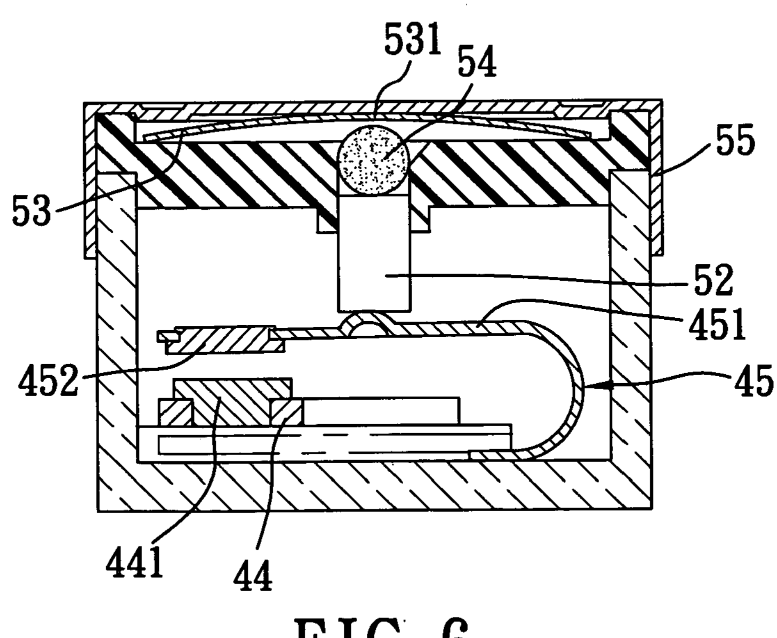
531
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FIG. 6

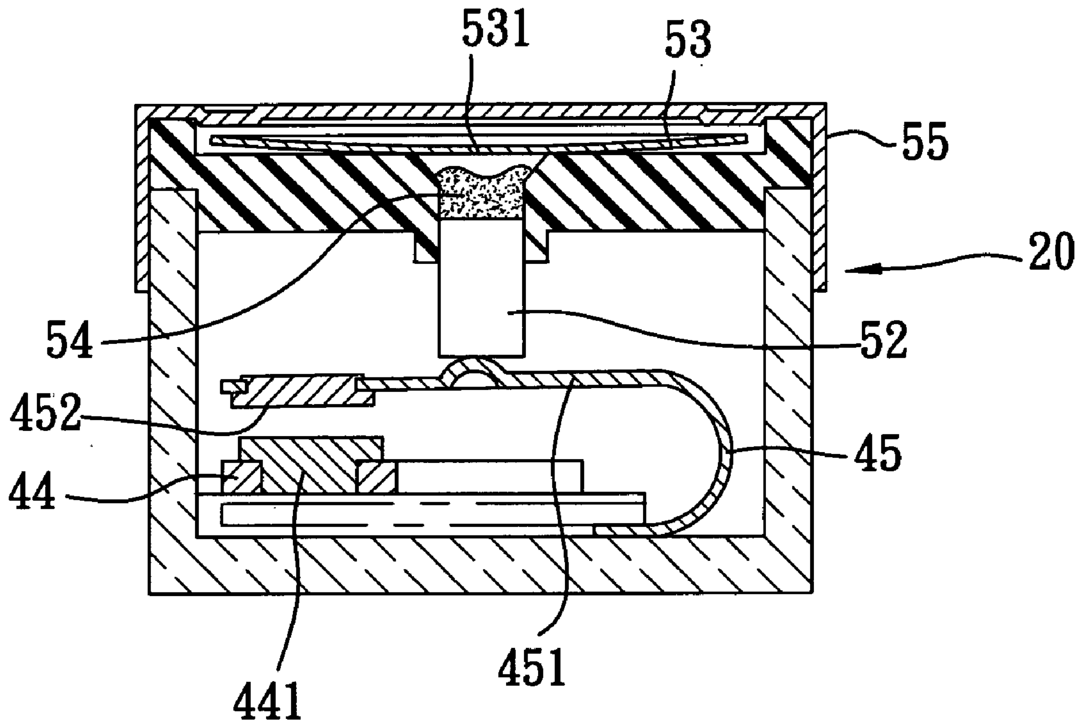

FIG. 7

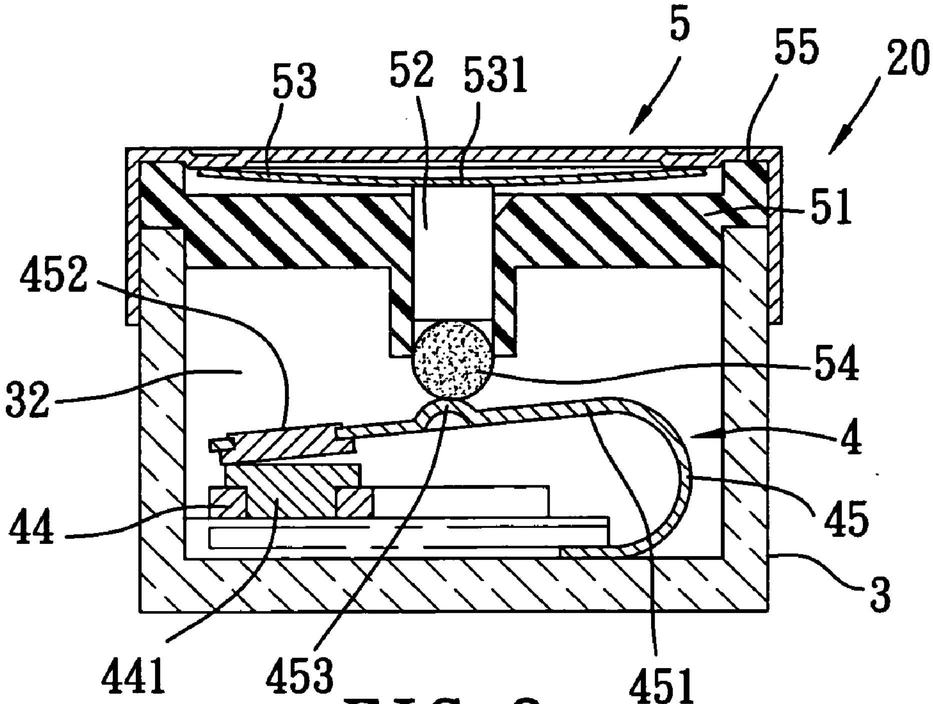
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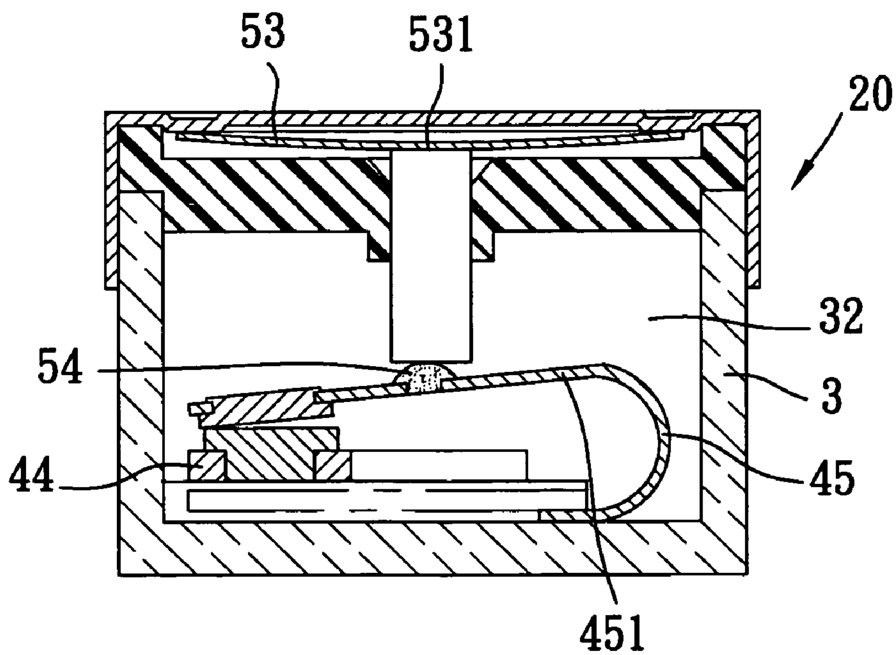
FIG. 8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451

FIG. 9

TEMPERATURE SWITCH

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] The invention relates to a temperature switch, more particularly to a temperature switch that has a temperature-sensing capability for controlling supply of power.

[0003] 2. Description of the Related Art

[0004] Referring to FIGS. **1** to **3**, a conventional temperature switch includes a porcelain housing **11**. The housing **11** has a bottom wall **111**, and a surrounding wall **113** that projects upwardly from an outer periphery of the bottom wall **111** and that cooperates with the same to define a receiving space **112**. The bottom wall **111** has a stepped portion **114**. The conventional temperature switch further includes opposite first and second conductors **12**, **13** disposed below the bottom wall **111** and connected electrically and respectively to two electrical wires **22**, **23**, a first conductive plate **14** disposed in the receiving space **112** and extending through the bottom wall **111** so as to connect electrically with the first conductor **12**, a second conductive plate **15** disposed in the receiving space **112** and extending through the stepped portion **114** so as to connect electrically with the second conductor **13**, a resilient movable conductive plate **16** disposed in the receiving space **112** and abutting against the first conductive plate **14**, a rod-support seat **17** mounted on the surrounding wall **113**, a porcelain control rod **18** extending slidably in a hole in the rod-support seat **17**, a temperature-responsive element **19** disposed in the rod-support seat **17** and abutting against the control rod **18**, and a metal cover **10** disposed on top of the rod-support seat **17** so as to cover the housing **11** and abutting against a heating element **21** of an electrical appliance (not shown). The movable conductive plate **16** has a contact part **161** located below the second conductive plate **15**, and a dome-shaped portion **162** disposed below and abutting against the control rod **18**. The second conductive plate **15** has a downwardly projecting contact part **151** for contacting the contact part **161** of the movable conductive plate **16**. The temperature-responsive element **19** has a curved portion **191** which deforms when reaching a preset deformation temperature. The preset deformation temperature is set as needed and may be either hot or cold. For example, the temperature switch installed in an electric iron requires a high deformation temperature, while the temperature switch installed in a drinking dispenser requires a low deformation temperature.

[0005] When the temperature switch is in an "on" position, as shown in FIG. **2**, the curved portion **191** of the temperature-responsive element **19** opens downwardly, and is in contact with the cover **10**. Furthermore, the control rod **18** is disposed between the curved portion **191** of the temperature-responsive element **19** and the dome-shaped portion **162** of the movable conductive plate **16**. Power is supplied through the electrical wire **22**, such that electrical current associated therewith passes through the first conductor **12**, the first conductive plate **14**, the movable conductive plate **16**, the second conductive plate **15**, the second conductor **13**, and into the electrical wire **23**.

[0006] Assuming a high (hot) preset deformation temperature when heat of the heating element **21** is transmitted from the cover **10** to the temperature-responsive element **19**, and the preset deformation temperature is reached, the curved portion **191** of the temperature-responsive element **19** will deform from opening downwardly shown in FIG. **2** to opening upwardly shown in FIG. **3**. As a result, the curved portion **191** downwardly biases the control rod **18**, which in turn downwardly biases the movable conductive plate **16** so as to move the contact part **161** of the movable conductive plate **16** away from the contact part **151** of the second conductive plate **15**. As such, electrical current cannot flow from the first conductive plate **14** to the second conductive plate **15**, thereby placing the temperature switch at an "off" position.

[0007] Although the aforementioned conventional temperature switch can achieve its intended purpose, when movable cooperation between components is not smooth, or when the curved portion **191** of the temperature-responsive element **19** fails to deform when the preset deformation temperature is reached, the "off" state of the temperature switch cannot be obtained. Furthermore, to enhance safe use of the electrical appliance, some manufacturers add a fuse to one of the electrical wires **22**, **23**. However, this complicates assembly of the conventional temperature switch.

SUMMARY OF THE INVENTION

[0008] Therefore, the object of the present invention is to provide a temperature switch that is capable of overcoming the aforementioned drawbacks of the prior art.

[0009] According to this invention, a temperature switch comprises an insulation housing, a switching unit installed in the housing, and a temperature control unit mounted on the housing. The switching unit includes a resilient movable conductive plate that is movable between on and off positions. The temperature control unit includes a heat-conductive cover that is adapted to conduct heat of a heating element, a temperature-responsive element abutting against the heat-conductive cover, a control rod, and a fuse element. The control rod and the fuse element are disposed between the temperature-responsive element and the movable conductive plate to be moved by the temperature-responsive element so as to contact the movable conductive plate. The control rod has two opposite ends respectively extending towards the temperature-responsive element and the movable conductive plate. The fuse element is disposed at one of the ends. When the fuse element is melted, the control rod is disconnected from the temperature-responsive element either structurally or functionally.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] Other features and advantages of the present invention will become apparent in the following detailed description of the preferred embodiments with reference to the accompanying drawings, of which:

[0011] FIG. **1** is an exploded perspective view of a conventional temperature switch;

[0012] FIG. **2** is a fragmentary sectional view of the conventional temperature switch in an assembled state, illustrating the conventional temperature switch in an "on" position;

[0013] FIG. **3** is a view similar to FIG. **2**, but with the conventional temperature switch in an "off" position;

[0014] FIG. **4** is an exploded perspective view of the first preferred embodiment of a temperature switch according to the present invention;

[0015] FIG. **5** is a fragmentary sectional view of the first preferred embodiment in an assembled state, illustrating the temperature switch of the present invention in an "on" position;

[0016] FIG. **6** is a view similar to FIG. **5**, but illustrating the temperature switch of the present invention in an "off" position;

[0017] FIG. **7** is a view similar to FIG. **5**, but illustrating a fuse element of the first preferred embodiment in a melted state;

[0018] FIG. **8** is a view similar to FIG. **5**, but illustrating the second preferred embodiment of a temperature switch according to the present invention; and

[0019] FIG. **9** is a view similar to FIG. **5**, but illustrating the third preferred embodiment of a temperature switch according to the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0020] Before the present invention is described in greater detail, it should be noted that like elements are denoted by the same reference numerals throughout the disclosure.

[0021] Referring to FIGS. **4** to **7**, the first preferred embodiment of a temperature switch **20** according to the present invention is adapted to be installed in an electrical appliance, and is shown to comprise an insulation housing **3**, a switching unit **4**, and a temperature control unit **5**.

[0022] The housing **3** is made of porcelain, and includes a bottom wall **31**, and a surrounding wall **33** projecting upwardly from an outer periphery of the bottom wall **31** and cooperating with the same to define a receiving space **32**. The bottom wall **31** has a stepped portion **311**.

[0023] The switching unit **4** includes two opposite first and second conductors **41**, **42** disposed below the bottom wall **31** and adapted to be connected electrically and respectively to electrical wires **22**, **23**, a conductive connecting plate **43** disposed within the receiving space **32** and having a downward projection **431** that extends through the bottom wall **31** and that is fixed to the first conductor **41**, a fixed conductive plate **44** disposed on the stepped portion **311** and having a downward projection **442** that extends through the bottom wall **31** and that is fixed to the second conductor **42**, and a resilient movable conductive plate **45**. The fixed conductive plate **44** has an upwardly projecting contact part **441**. The movable conductive plate **45** has a curved portion **450** fixed to the bottom wall **31** and abutting against the conductive connecting plate **43**, and a resilient portion **451** disposed above the fixed conductive plate **44**. The resilient portion **451** has a downwardly projecting contact part **452** located above the contact part **441** of the fixed conductive plate **44**, and a dome-shaped part **453** between the curved portion **450** and the contact part **452**. In an "off" position of the temperature switch **20**, the contact part **452** of the resilient portion **451** is spaced apart from the contact part **441** of the fixed conductive plate **44**, and electrical current from the electrical wire **22** can only be transmitted to the conductive connecting plate **43** and the movable conductive plate **45** through the first conductor **41**. The electrical current cannot flow to the second conductor **42** through the fixed conductive plate **44** in this state.

[0024] A plastic rod-support seat **51** is mounted on top of the surrounding wall **33** of the housing **3**, and has a bottom plate **511**, and an annular protrusion **513** projecting downwardly from the center of the bottom plate **511** and defining a passage hole **512**. The movable conductive plate **45** is located below the rod-support seat **51**.

[0025] The temperature control unit **5** includes a control rod **52**, a temperature-responsive element **53**, a fuse element **54**, and a heat-conductive cover **55**. The control rod **52** is made of porcelain, and extends slidably in the passage hole **512**. In this embodiment, the dome-shaped part **453** of the resilient portion **451** of the movable conductive plate **45** is in contact with a bottom end of the control rod **52**.

[0026] The fuse element **54**, in this embodiment, is configured as a tin ball, and is positioned in the passage hole **512**.

[0027] The temperature-responsive element **53** is formed as a convex disc, and is disposed above the rod-support seat **51**. The convex disc has an outer periphery **532**, and a convex portion **531** in contact with the fuse element **54**. The fuse element **54**, in this embodiment, is disposed between a top end of the control rod **52** and the convex portion **531** of the temperature-responsive element **53**.

[0028] The fuse element **54** has a melting temperature that can be set as needed. Generally, the melting temperature of the fuse element **54** is set between 180~220° C. The temperature-responsive element **53** has a deformation temperature that can also be set as needed. For example, the deformation temperature can be set at 100° C., 140° C., 180° C., etc.

[0029] The heat-conductive cover **55** is disposed above the rod-support seat **51**, and is connected to the housing **3** opposite to the bottom wall **31**. The cover **55** is adapted to abut against a heating element **21** of an electrical appliance (not shown) so as to conduct heat emanating from the heating element **21**. Normally, the outer periphery **532** of the temperature-responsive element **53** is placed in contact with a bottom surface of the cover **55**, and the convex portion **531** of the temperature-responsive element **53** extends away from the bottom surface of the cover **55**.

[0030] When the temperature switch **20** is in an "on" position, as shown in FIG. **5**, the resilient portion **451** of the movable conductive plate **45** is pressed downwardly through coordination of the control rod **52**, the temperature-responsive element **53**, and the fuse element **54**, so that the contact part **452** of the resilient portion **451** abuts against the contact part **441** of the fixed conductive plate **44**. At this time, electrical current supplied through the electrical wire **22** passes consecutively through the first conductor **41**, the conductive connecting plate **43**, the movable conductive plate **45**, the fixed conductive plate **44**, the second conductor **42**, and into the electrical wire **23**.

[0031] In use, when heat from the heating element **21** is transmitted to the temperature-responsive element **53** through the heat-conductive cover **55**, and reaches the deformation temperature of the temperature-responsive element **53**, the convex portion **531** of the temperature-responsive element **53** deforms from a state shown in FIG. **5** to another state shown in FIG. **6**. At this time, the resilient portion **451** of the movable conductive plate **45** biases upwardly the control rod **52** and the fuse element **54**, resulting in movement of the contact part **452** of the resilient portion **451** away from the contact part **441** of the fixed conductive plate **44**. This prevents electrical current from flowing to the fixed conductive plate **44**, and places the temperature switch **20** in an "off" position, as shown in FIG. **6**.

[0032] When the temperature reaches another preset value, the convex portion **531** of the temperature-responsive element **53** deforms again from the state shown in FIG. **6** to the state shown in FIG. **5**, so that the temperature switch **20** is restored to its "on" position.

[0033] It should be noted that the convex portion **531** of the temperature-responsive element **53** deforms when a preset temperature is reached. However, if the convex portion **531** did not deform as expected due to the abnormal operation of the temperature-responsive element **53**, the heat absorbed by the heat-conductive cover **55** will increase continuously until the heat transmitted to the fuse element **54** through the temperature-responsive element **53** reaches the melting point of the fuse element **54**, at which point the fuse element **54** will start to melt. Eventually, a gap is produced between the fuse element **54** and the convex portion **531** of the temperature-responsive element **53**, as shown in FIG. **7**. This will permit the resilient portion **451** of the movable conductive plate **45** to bias upwardly the control rod **52** and move the contact part **452** of the resilient portion **451** away from the contact part **441** of the fixed conductive plate **44**, thereby putting the temperature switch **20** in the "off" position. Hence, when the temperature transmitted to the cover **55** is higher than the deformation temperature of the temperature-responsive element **53**, but the temperature-responsive element **53** is defective, through the melting of the fuse element **54**, the flow of current through the temperature switch **20** can still be prevented. The temperature switch **20** of the present invention, therefore, has a built-in safety function.

[0034] Referring to FIG. **8**, the second preferred embodiment of a temperature switch **20** according to the present invention is shown to be similar to the first preferred embodiment. However, in this embodiment, the fuse element **54** is disposed between the bottom end of the control rod **52** and the dome-shaped part **453** of the resilient portion **451** of the movable conductive plate **45**. When the temperature inside the receiving space **32** is higher than the melting temperature of the fuse element **54**, the fuse element **54** will melt, and a gap will be produced between the control rod **52** and the convex portion **531** of the temperature-responsive element **53**. This will permit the resilient portion **451** of the movable conductive plate **45** to bias upwardly, which in turn results in movement of the contact part **452** of the resilient portion **451** away from the contact part **441** of the fixed conductive plate **44**.

[0035] Referring to FIG. **9**, the third preferred embodiment of a temperature switch **20** according to the present invention is shown to be similar to the second preferred embodiment. However, in this embodiment, the fuse element **54** is configured as a stud or a rivet fixed to there silient portion **451** of the movable conductive plate **45**. Similarly, when the temperature inside the receiving space **32** is higher than the melting temperature of the fuse element **54**, the fuse element **54** will melt and permit there silient portion **451** of the movable conductive plate **45** to bias upwardly and away from the fixed conductive plate **44**.

[0036] While the present invention has been described in connection with what is considered the most practical and preferred embodiments, it is understood that this invention is not limited to the disclosed embodiments but is intended to cover various arrangements included within the spirit and scope of the broadest interpretation so as to encompass all such modifications and equivalent arrangements.

I claim:

1. A temperature switch comprising:

an insulation housing;

a switching unit installed in said housing, and including a resilient movable conductive plate that is movable between on and off positions; and

a temperature control unit mounted on said housing, and including a heat-conductive cover that is adapted to conduct heat of a heating element, a temperature-responsive element abutting against said heat-conductive cover, a control rod, and a fuse element, said control rod and said fuse element being disposed between said temperature-responsive element and said movable conductive plate to be moved by said temperature-responsive element so as to contact said movable conductive plate, said control rod having two opposite ends respectively extending towards said temperature-responsive element and said movable conductive plate, said fuse element being disposed at one of said ends;

wherein when said fuse element is melted, said control rod is disconnected from said temperature-responsive element either structurally or functionally.

2. The temperature switch of claim 1, further comprising a rod-support seat, said heat-conductive cover and said temperature-responsive element being disposed above said rod-support seat, said movable conductive plate being located below said rod-support seat, said rod-support seat having a passage hole, said control rod extending slidably in said passage hole.

3. The temperature switch of claim 2, wherein said fuse element is positioned in said passage hole on top of said control rod and in contact with said temperature-responsive element.

4. The temperature switch of claim 2, wherein said fuse element is positioned in said passage hole beneath said control rod and in contact with said movable conductive plate.

5. The temperature switch of claim 2, wherein said fuse element is disposed beneath said control rod, and is fixed to said movable conductive plate.

6. The temperature switch of claim 5, wherein said fuse element is formed as a stud fixed to said movable conductive plate and projecting from said movable conductive plate toward said control rod.

7. The temperature switch of claim 2, wherein said temperature-responsive element is formed as a convex disc, said convex disc having an outer periphery placed in contact with a bottom surface of said heat-conductive cover, and a convex portion extending away from said bottom surface and contacting one of said ends of said control rod and said fuse element.

8. The temperature switch of claim 7, wherein said housing includes a bottom wall, and a surrounding wall projecting upwardly from said bottom wall, said heat-conductive cover being connected to said housing opposite to said bottom wall.

9. The temperature switch of claim 8, wherein said switching unit further includes a fixed conductive plate, said movable and said fixed conductive plates being mounted on said bottom wall, said fixed conductive plate having a fixed contact part to contact said movable conductive plate.

* * * * *